Capability Areas of Interest

- PEO STRI and the Army rely on new ideas and emerging technologies developed by industry. -

Training Products and Services -Live-

- Virtualization Technologies
- Live Force-on-Force Medical Capabilities
- Mobile Multi-media Wireless Networks
- Embedded Training
- Accurate and Affordable High-Fidelity Weapon Orientation Sensor
- Accurate and Affordable Geo-location Capabilities for Indoor and GPS-denied Environments
- Adaptive Behavior Targets

Training Products and Services -Virtual-

- High-Fidelity Immersive Training Environment
- Virtualization Technologies
- Synthetic Natural Environment Enhancements
- Virtual Environment
- Interoperability
- High-Fidelity Medical Simulations
- Sensor Technologies
- Modeling and Behaviors

Training Products and Services -Constructive-

- Global Simulation Capability and Simulation as a Service
- Hybrid Simulation
- Human Intelligence Collection Operations Modeling
- Dynamic Model Resolution
- Environmental Correlation

Training Products and Services -Gaming-

- Virtualization Technologies
- Synthetic Natural Environment Enhancements
- Virtual Environment
- Avatars for Human Intelligence
- Realistic Life Forms
- Visualization Technologies
- Intelligent/Expert Tutoring and Performance Feedback

Testing Products and Services

- Threat Cyber Capabilities
- High Resolution Radar
- Multi-spectral Modular Reconfigurable Facades
- Time-Space Position Information (TSPI) in GPS-denied Environment
- Software-defined Radios (SDR)/Cognitive Radios/Dynamic Spectrum Assess (DSA) Technologies
- Remote Target Control System
- Fuel Cell
- Digital Radio Frequency Memory (DRFM)

- **Virtualization Technologies:**

  Delivery of training and simulation services from centrally located simulation/processing hubs to provide better utilization and efficiency, and simplified support and maintenance.

- **Live Force-on-Force Medical Capabilities:**

  Realistic casualty assessment algorithms based on weapon, ammunition, impact location, and use of body armor to replace the existing MILES casualty cards; Capability to perform Buddy/Self Aid via MILES devices; Allow combat medics to treat, administer aid to, and perform evacuations of "wounded" participants; Develop a medic's field equipment pack to track usage during a training exercise; "Instrument" these capabilities.

- **Mobile Multimedia Wireless Networks:**

  Highly scalable and mobile multimedia wireless networks using spectrum efficient and frequency agile software defined radio technology with QoS. Capable of providing seamless movement across vast training/testing areas with low latency MANET, multi-hop and point to multipoint connectivity.

- **Embedded Training:**

  Technologies for embedding training and simulation capabilities on tactical platforms and leveraging tactical platform hardware to perform dual functions to support both operational as well as training capabilities and mission rehearsal functions. Alignment with the VICTORY (Vehicular Integration for C4ISR/EW Interoperability) architecture and standard initiative for integrating electronics on Army ground vehicles and limiting SWaP-C impact to the tactical platform.

- **Accurate and Affordable High Fidelity Weapon Orientation Sensor:**

  Provides high fidelity pointing vectors for weapons within their operational environments (i.e., ferrous metals); Accuracy: < .1 degrees; Small form/fit, SWaP-C, Non-obtrusive to player/weapon; Simple calibration method.

- **Accurate and Affordable Geo-location Capabilities for Indoor and GPS-denied Environments:**

  A high fidelity position/location system for real-time tracking soldiers in an indoor/urban or GPS-denied environment; Accuracy: 6-8 inches/15-17 cm (T); 3-4 inches/10 cm (O); Low impacts to both soldier and infrastructure; Instrumentation System interoperability.

- **Adaptive Behavior Targets:**

  Provision of an autonomous behavior target that portrays an asymmetric and reactive threat using sensor inputs. Enhanced target realism with realistic thermal/IR signatures, improved mobility (i.e. track-less) and bi-directional voice capabilities. Capable of inter-target communication/data sharing and reactions to events on other targets. Capable of supporting live fire with minimal failures/high RAM.

Capability Areas of Interest
Training Products and Services – Virtual

- **High Fidelity Immersive Training Environment:**
  Believable, well-developed and economically feasible "interactive" computer-generated virtual humans and targets. Trainee interacts with, controls and commands virtual humans and targets in the ITE using natural language, motions and gestures. Realistic & cost effective locomotion of the trainee in the ITE. Effective implementation of VR/AR/MR technologies. Increase cognitive and emotional stressors.

- **Virtualization Technologies:**
  Delivery of "distributed" training and simulation services from centrally located simulation/processing hubs to provide better utilization and efficiency, and simplified support and maintenance. Effective implementation of Cloud computing, virtualization and SOA concepts/technologies.

- **Synthetic Natural Environment Enhancements:**
  Support air and ground mission rehearsal systems with rapid updates to existing terrain databases. Allow trainee to interact with physics-based models and receive appropriate feedback in the synthetic environment associated with route clearance/IED defeat and construction equipment training systems. Manipulateof physics-based virtual objects in a virtual environment. Common, robust weather and atmospheric simulation for real-time training systems in a DIS environment. Realistic life form representation in virtual simulations. Modeling and behaviors of soil/water characteristics.

- **Virtual Environment:**
  Modeling of Obscurants/Illumination: Improve modeling of obscurants and illumination that impact sensors-behaviors and target engagement. Moving models with realistic thermal signatures.

- **Interoperability:**
  Interoperability between virtual simulations, between virtual and constructive simulations, between virtual and live simulations. Common correlated terrains, fair fight engagements, SAF behaviors, etc.

- **High Fidelity Medical Simulation:**
  Medical simulations whose interaction with the virtual world more realistically portrays the level of fidelity necessary to readily transfer the learning experience to actual patients; high fidelity medical simulations should match the vagaries of the individualistic nature of the human body and be easily User re-programmable to capture multiple nuances of a similar condition. High fidelity medical simulations to support combat medic, surgical support and ER team training.

- **Sensor Technologies:**
  Sensor technologies to support immersive training environment: head tracking, eye tracking, weapons orientation, haptics, motion tracking, etc.

- **Modeling and Behaviors**
  Provide physics-based modeling of ammunition effects and environmental damage. Provide realistic behaviors for virtual humans and crowds.

- **Global Simulation Capability and Simulation as a Service:**

  Delivery of training and simulation services from centrally located simulation/processing hubs to provide better utilization and efficiency, and simplified support and maintenance. Effective implementation of Cloud computing, virtualization and SOA concepts/technologies.

- **Hybrid Simulation:**

  That allow running of federations either in non-time managed, best effort mode or time managed, reliable delivery mode or runtime combination of these two modes utilizing a single simulation data distribution mechanism.

- **Human Intelligence Collection Operations Modeling:**

  Modeling and simulation of the complex Human Intelligence Process of collection and reporting. Simulation of human sources with unpredictable and sometimes unrealistic results. Modeling unpredictable human intelligence sources to produce more realistic results. Conveying of range of emotions on synthetic voices.

- **Dynamic Model Resolution:**

  Ability to dynamically load and unload model components during runtime to vary the capabilities of entities.

- **Environment Correlation:**

  Tools, technologies and processes to support quantification of correlation in environment databases and mechanisms to facilitate fixes and workaround.

- **Virtualization Technologies:**

  Delivery of training and simulation services from centrally located simulation/processing hubs to provide better utilization and efficiency, and simplified support and maintenance. Effective implementation of Cloud computing, virtualization and SOA concepts/technologies.

- **Synthetic Natural Environment Enhancements:**

  Support air and ground mission rehearsal systems with rapid updates to existing terrain databases. Allow trainee to interact with physics-based models and receive appropriate feedback in the synthetic environment associated with route clearance/IED defeat and construction equipment training systems.

- **Virtual Environment:**

  Modeling of Obscurants/Illumination: Improve modeling of obscurants and illumination that impact sensors-behaviors and target engagement.

- **Avatars for Human Intelligence:**

  Custom characters, animations, and detailed features to create realistic avatars for close human interaction.

- **Realistic Life Forms:**

  Virtual humans with advanced behaviors, crowd behaviors, and animals.

- **Visualization Technologies:**

  High fidelity/resolutions, 3D.

- **Intelligent/Expert Tutoring and Performance Feedback.**

Capability Areas of Interest

Testing Products and Services

- **Threat Cyber Capabilities:**

  The capability to design, develop, and acquire threat cyber capabilities for threat Computer Network Operations (CNO), threat Computer Network Attack (CNA) and Computer Network Defense (CND) for the DoD and Services cyber test and evaluation; Remote command and control of multiple cyber offensive platforms; Model and execute offensive cyber activities to provide force multiplier effects for test and training events.

- **High Resolution Radar:**

  The capability for radar processing and signature measurements for munitions, sub-munitions, and high altitude missile intercepts. Process large amounts of high resolution data. Capture and process highly detailed data on impact and dispersion. Determine final locations of all shrapnel to facilitate safe removal. Perform post mission 3D visualization for distribution and lethality assessment.

- **Multi-spectral Modular Reconfigurable Facades:**

  The capability to provide facades of urban buildings that are modular, reconfigurable, transportable and that represent radio frequency, infrared and other spectrum characteristics.

- **Time-Space Position Information (TSPI) in GPS Denied Environment:**

  High fidelity position/location system for real-time tracking in an indoor/urban or GPS-denied environment.

- **Software Defined Radios (SDR)/Cognitive Radios/Dynamic Spectrum Assess (DSA) Technologies:**

  Affordable approach to support test/training applications; Configurable multi-spectrum SDR/Cognitive radios; spectrum efficient, frequency agile; small form/fit.

- **Remote Target Control System:**

  Low cost sophisticated remote target control; Simultaneous remote control of mixed target platforms; remote control in a GPS denied environment.

- **Fuel Cell:**

  Small, low cost, light weight, efficient fuel cells for dismounts.

- **Digital Radio Frequency Memory (DRFM):**

  Physics/effects modeling of Digital Radio Freq Memory (DRFM) waveforms in M&S and injection for electronic attack simulators.

Capability Areas of Interest

Project/Program	Capability Gap	Domains	Description
•IEWTPT Human Intelligence (HUMINT) Control Cell (HCC) •VBS2 •Dismounted Soldier Training Systems (DSTS)	•Character Customization and Realistic Human-Avatar Interactions. •Avatar Speech Patterns in Co-Relation with Facial Gestures. •Unique and Varied 3D Character Modelization •Complex Avatar Skeletal Structure Allowing for Accurate Lip Synching and Independent Eye Movement.	Virtual and Constructive	Ability to produce custom characters, animations, and detailed features to help create realistic avatars for close human - emotion interactions. Automatic lip synching, eye movement, facial gestures co-related to computer generated speech. Unique 3D Character models with flexible bone structure allowing different height characters and different genders. Skeleton structure that allows for complex facial animations and/or detailed moving of the mouth. Including independent eye movement.
•SE Core and recipients of SE Core Geospatial data	•Automation of GIS Vector and Imagery Alignment	Live, Virtual and Constructive	Currently an estimated 70-80% of all database development funds are used to manually align vector data to imagery (e.g. Correcting NGA data by moving roads and rivers to correct locations using imagery) Developing ways to automate parts or all of this would provide a significant cost savings to the Army. With the advent of GPU Shader technologies and enhanced compute power, the semi-automation of this arduous task is perhaps within reach. This SIBR effort would research the possibilities of using current technologies utilizing imagery analysis to find processes and tools to simplify an otherwise labor intensive effort.

Capability Areas of Interest

Project/Program	Capability Gap	Domains	Description
•SE Core would develop the processes and procedures to produce the required common source lifeform models, and export them to each targeted IG runtime lifeform system. Other Army programs of record (i.e. CCTT, AVCATT, GCTT, GFT(VBS2) would integrate these runtime lifeform models into their system.	•Common Lifeform Model	Virtual, Constructive (stealths)	Currently the visual models for lifeforms (Civilians, soldier, combatants, and animals) are modeled with a variety of architectures with dependencies on the IG runtime lifeform interfaces (primarily COTS) that necessitate a unique model per IG runtime lifeform architecture. SE Core would need to model a lifeform library for each IG runtime lifeform system. SE Core needs a capability to model a visual lifeform model once and export it to a variety of virtual IG runtime lifeform systems. The SE Core Common Lifeform Model (CLM) shall represent a superset of all attribution, and data structures necessary to facilitate export to a variety of targeted IG runtime lifeform services. Market surveys shall analyze the market to identify targeted runtime lifeforms systems. Cost analysis shall be conducted such that proposed solutions shall consider lifeform modeling, motion capture, runtime model export, runtime IG model integration and runtime IG lifeform services integration costs. A CLM specification and a translation mapping to each targeted IG runtime lifeform systems shall be defined. Another consideration would include the development of a common IG runtime lifeform service which would provide a common representation of lifeform behaviors. Markets analysis of capabilities and cost benefit analysis should be conducted.
•JLCCTC, LVC-IA, OneSAF	•Rapid Simulation Federation Data Alignment	Live, Virtual, Constructive	In any simulation federation such as JLCCTC there is a need to build individual simulation scenario and parametric databases in a fashion such that common data elements that are required to initialize more than one federation component are provided to these components consistently. For example the force database task organization shared by two federates within the JLCCTC federation should come from one authoritative data source and should be represented consistently as seen by these two components.

Capability Areas of Interest

Project/Program	Capability Gap	Domains	Description
•JLCCTC, OneSAF	•Non-Traditional DCGS-A stimulation capability	Constructive	For years the constructive training community has interfaced and simulated ASAS and now DCGS-A via a series USMTF text messages with fixed format and limited data content. Since DCGS-A has the ability to filter, store, search and analyze a wide variety of data sources the simulations community should not continue to operate within the bounds of these fixed format, limited content messages. New and innovative stimulation products to ffed intel staff and analysts based on events and conditions in constructive simulations are needed.
•JLCCTC, OneSAF	•Hybrid Simulation Architecture	Constructive	The JLCCTC program has a need to accommodate and facilitate interoperation of models/tools that primarily exist in a connected, time managed and mostly aggregate federations and models/tools that primarily operate in a connectionless, non time managed, mostly entity level federations within a single federation infrastructure. A hybrid approach that allows a single federation infrastructure to be configured to run in a variety of modes based on the scenario, training objective and model compositions in required.
•JLCCTC	•Virtual Test Environment (the ability to integrate and Test all or part of a Live, Virtual and Constructive Federation, across a wide geographic area, while providing real time audio and video collaboration).	Live, Virtual, Constructive and Test	Because a PEO-STRI goal is to provide an integrated training solution, including Live, Virtual and Constructive (LVC) domains, the integration of GOTS and COTS hardware and software has to be achieved between groups of disparate developers. In order to accomplish this, there exists a frequent need to test the interfaces by traveling to a common lab location. This testing may also occur within a single domain, or between 2 or more domains. Because of the geographically distributed nature of the contractor's facilities and the material developers' labs, a "Virtual Development Lab", including an audio/video collaboration environment is needed. This capability would reduce the duplication of hardware between

Project/Program	Capability Gap	Domains	Description
•WARSIM, OneSAF, SE CORE	•Automated Feature Extraction from imagery and raster data	Live, Virtual and Constructive	Currently, we do not have the capability, as part of our terrain generation process, to combine different resolutions/types/sources of Imagery and Raster data (at different levels of resolution) and extract road, vegetation and building vector data. Current feature extraction processes are manual or highly dependent on user manipulation. Most specifically, what is needed is the Combination of different sources (i.e. Google Earth, Google Maps, NGA CIB, NGA CADRG etc) of raster maps and imagery data into a seamless unified source from which to automatically extract road networks, vegetation and Building features. Most specifically, the edges of these different raster and imagery sources should be automatically 'stitched' to provide a seamless source of data from which road network, Building, and vegetation data can be extracted. Extraction of attribution from the buildings and other features should be done with minimal user intervention to expedite the time it takes to generate this data. Finally, the extracted feature data should be populated with EDCS (WARSIM EDM) and VPF (NGA) data dictionary attribution to support our current terrain generation tools.
•WARSIM, OneSAF	•Enhanced Dynamic Weather/Terrain Effects	Live, Virtual and Constructive	Currently, weather does not affect the mobility of units in WARSIM. Most specifically, dynamic weather characteristics such as precipitation, do not affect route planning and related costs functions in WARSIM. At this point, mobility is only affected by static feature attribution in SNE features (the STGJ in the features used to calculate speed reduction factors) and the slope calculated with the terrain skin triangles. As a result, changes in weather do not affect the static terrain (triangles and/or features) and the mobility of units at runtime. We could take advantage of dynamic terrain technologies that would re-poligonize the terrain skin of an area as a result of weather events at runtime (events such as heavy precipitation, snow,

Project/Program	Capability Gap	Domains	Description
•JLCCTC	•Flexible, multi domain, three enclave architecture	Constructive	The current Cross Domain solution for the JLCCTC MRF-federation provides for the main ground simulation to exist only in the lowest (usually coalition releasable) enclave. However, many US Mission Command applications can only reside in a US Only SECRET enclave. Therefore, flexible two way communications are required between Mission Command adapter applications in a higher enclave and the main ground simulation in a lower enclave. An alternative would be to provide a CDS that enables two way communications between a simulation interface at a lower enclave communicating with a Mission Command application operating at a higher enclave.
•JLCCTC, OneSAF	•Networking challenge when interfacing simulations to multiple AFATDS applications using native AFATDS capability and a single ExCIS interface device	Constructive	IP addresses for simulated platforms typically go in the same class C network as the live FDC that they are assigned to. If there is only one live AFATDS in the architecture, ExCIS can be placed in that network. If there is more than one live AFATDS, ExCIS would sit in one of those networks or in its own separate class C. Since those platforms are simulated, their native AFATDS communications originate from the ExCIS machine, who assumes the IPs for all the simulated units, all in different class C networks. However, the live FDCs trying to stimulate their simulated subordinate platforms, will never be able to reach them since their respective routers will not try to go outside its own class C network. There are two main feasible solutions. One is to have an inject point at every real class C network, besides each live box or subnet (class C) of live boxes, to send/receive messages directed for simulated platforms. This can be an additional ExCIS box (suboptimal – increases footprint) or another box or networking equipment that can take these IPs and send them to same network the ExCIS box is in. The other solution is to save off the user's live AFATDS database, load a simulation database that will have all simulated platforms point to the routable ExCIS IP, and